



# STGE50NB60HD

## N-CHANNEL 50A - 600V ISOTOP PowerMESH™ IGBT

PRELIMINARY DATA

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGE50NB60HD	600 V	< 2.8 V	50 A

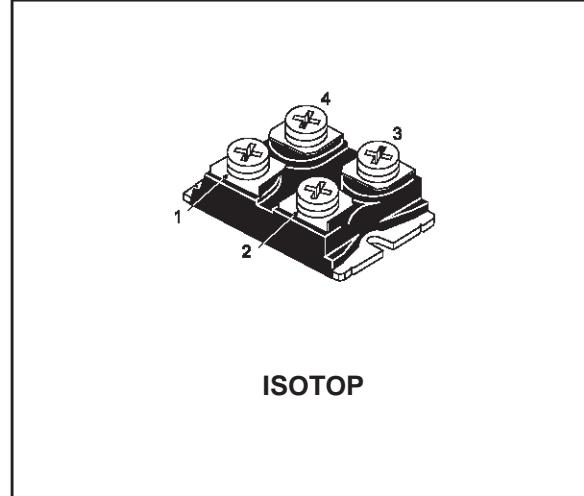
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V<sub>CESAT</sub>)
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE

### DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "H" identifies a family optimized to achieve very low switching times for high frequency applications (<120kHz).

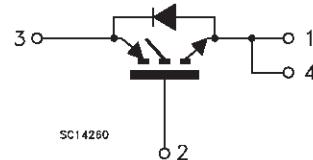
### APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- WELDING EQUIPMENTS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES



ISOTOP

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 20	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 25 °C	100	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 100 °C	50	A
I <sub>CM</sub> (•)	Collector Current (pulsed)	400	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	300	W
	Derating Factor	2.4	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

## STGE50NB60HD

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### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.416	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	30	°C/W
R <sub>thc-h</sub>	Thermal Resistance Case-heatsink	Typ	0.1	°C/W

### ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>BR(CES)</sub>	Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 250 μA V <sub>GE</sub> = 0	600			V
I <sub>CES</sub>	Collector cut-off (V <sub>GE</sub> = 0)	V <sub>CE</sub> = Max Rating T <sub>j</sub> = 25 °C V <sub>CE</sub> = Max Rating T <sub>j</sub> = 125 °C			100 1000	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ± 20 V V <sub>CE</sub> = 0			± 100	nA

### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA	3		5	V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 15 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V I <sub>C</sub> = 50 A T <sub>j</sub> = 125 °C		2.3 1.9	2.8	V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V I <sub>C</sub> = 50 A		22		S
C <sub>ies</sub> C <sub>oes</sub> C <sub>res</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>CE</sub> = 25 V f = 1 MHz V <sub>GE</sub> = 0		4500 450 90		pF pF pF
Q <sub>G</sub> Q <sub>GE</sub> Q <sub>GC</sub>	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V <sub>CE</sub> = 480 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V		260 28 15		nC nC nC
I <sub>CL</sub>	Latching Current	V <sub>clamp</sub> = 480 V R <sub>G</sub> = 10 Ω T <sub>j</sub> = 150 °C	200			A

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Delay Time Rise Time	V <sub>CC</sub> = 480 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V R <sub>G</sub> = 10 Ω		20 70		ns ns
(di/dt) <sub>on</sub> E <sub>on(0)</sub>	Turn-on Current Slope Turn-on Switching Losses	V <sub>CC</sub> = 480 V I <sub>C</sub> = 50 A R <sub>G</sub> = 10 Ω V <sub>GE</sub> = 15 V T <sub>j</sub> = 125 °C		350 950		A/μs μJ

**ELECTRICAL CHARACTERISTICS** (continued)

## SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-Over Time	$V_{CC} = 480 \text{ V}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time	$I_C = 50 \text{ A}$ $R_{GE} = 10 \Omega$		48		ns
$t_d(off)$	Delay Time	$V_{GE} = 15 \text{ V}$		326		ns
$t_f$	Fall Time			90		ns
$E_{off}(**)$	Turn-off Switching Loss			2.1		mJ
$E_{ts(\odot)}$	Total Switching Loss			3		mJ
$t_c$	Cross-Over Time	$V_{CC} = 480 \text{ V}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time	$I_C = 50 \text{ A}$ $R_{GE} = 10 \Omega$		75		ns
$t_d(off)$	Delay Time	$V_{GE} = 15 \text{ V}$		340		ns
$t_f$	Fall Time	$T_j = 125 \text{ }^\circ\text{C}$		200		ns
$E_{off}(**)$	Turn-off Switching Loss			2.9		mJ
$E_{ts(\odot)}$	Total Switching Loss			3.85		mJ

**COLLECTOR-EMITTER DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_f$	Forward Current				50	A
$I_{fm}$	Forward Current pulsed				400	A
$V_f$	Forward On-Voltage	$I_f = 50 \text{ A}$ $I_f = 50 \text{ A}$		2		V
						V
$t_{rr}$	Reverse Recovery Time	$I_f = 50 \text{ A}$		200		nS
$Q_{rr}$	Reverse Recovery Charge	$V_R = 200 \text{ V}$				nC
$I_{rrm}$	Reverse Recovery Current	$dI/dt = 100 \text{ A}/\mu\text{s}$				A

(•) Pulse width limited by max. junction temperature

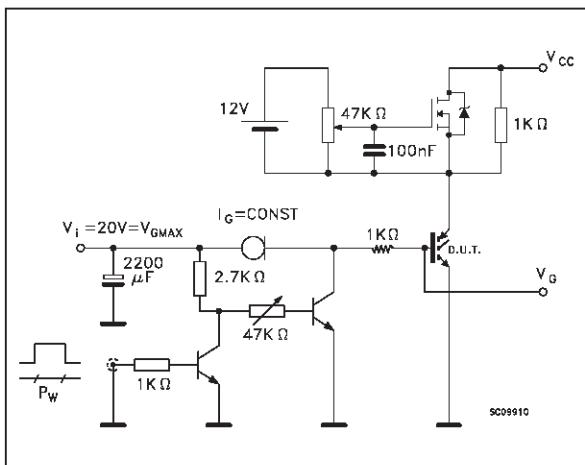
(◦) Include recovery losses on the STTA2006 freewheeling diode

(\*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

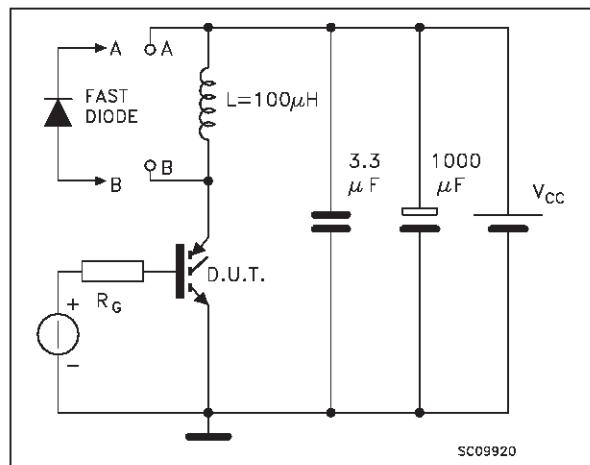
(\*\*) Losses Include Also The Tail (Jedec Standardization)

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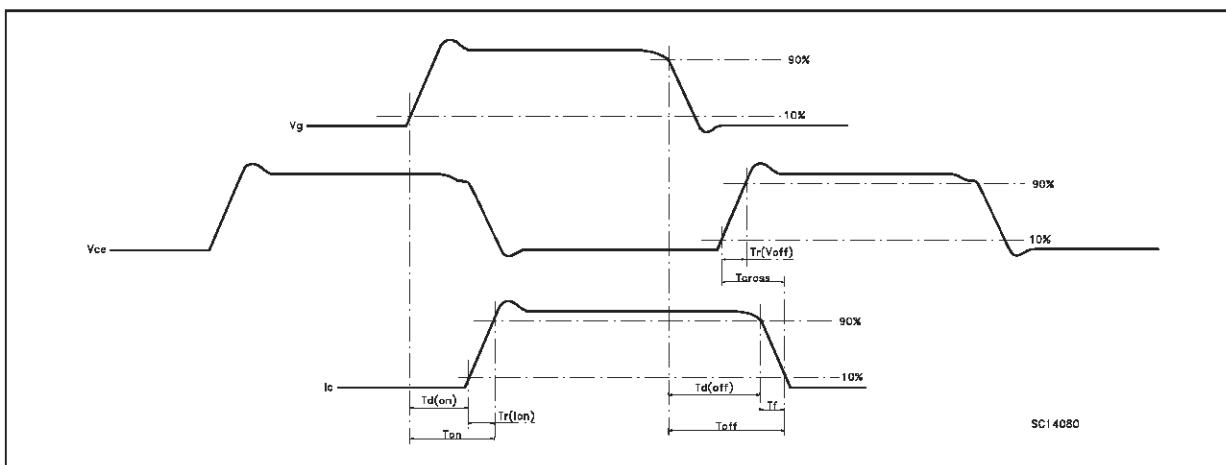
**Fig. 1:** Gate Charge test Circuit



**Fig. 2:** Test Circuit For Inductive Load Switching

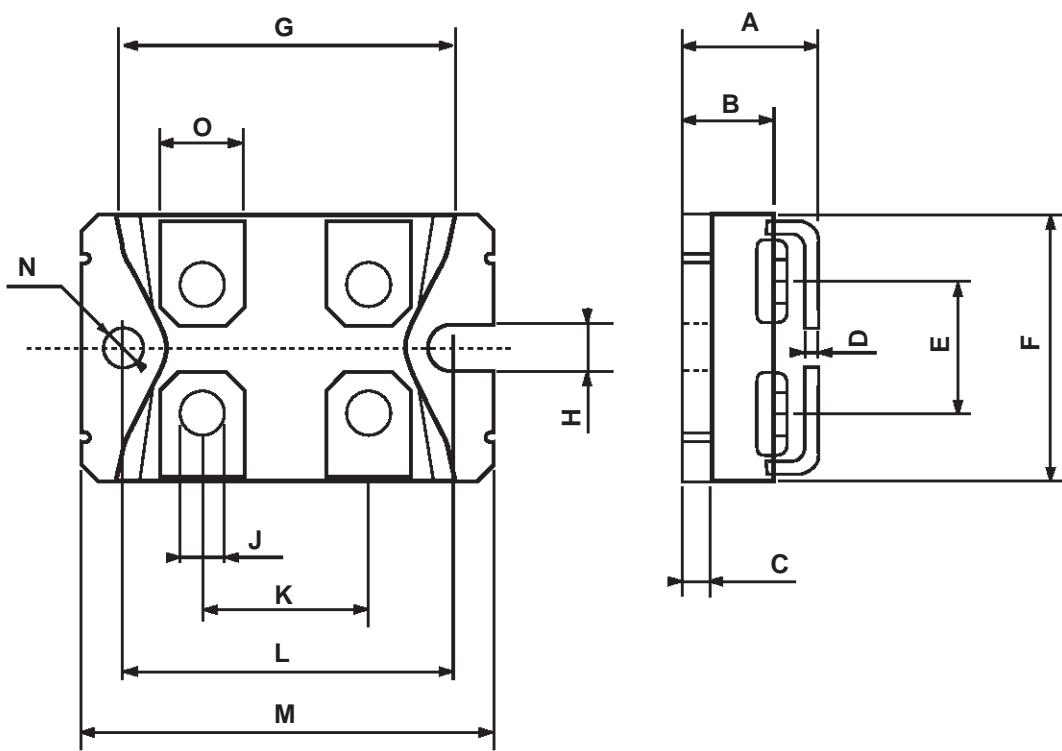


**Fig. 3:** Switching Waveforms



## ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



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